7-14-2010

Robley Dunglison, Professor of Physiology [University of Virginia] to Joseph Lovell [Washington, DC] regarding: experiments suggested by Dunglison on artificial digestion. January 12, 1833

University of Virginia
January 12th 1833.

A.1.

Dear Sir,

My friend Mr Trist will explain to you the causes that have prevented me from witnessing, and executing at, the Experiments instituted by Dr Beaumont and yourself, on the interesting and rare case, which it now and has been, engaging your attention; as well as many from expressing in person my high sense of the honor you do me by desiring that I should be, in any manner associated with you. I had seen a detail of certain experiments by yourself and Dr Beaumont on the subject of this case several years ago, and had fully intended to notice them in a work on Human Physiology recently published by me, but the Journal was mislaid, and I owned no copy of it in time. One of these experiments, if I recollect right, was on artificial digestion, and the result shewed, that a piece of corned beef experienced the same changes as when it was inserted, through the wound, into the interior of the stomach; — and another, that the vegetable substances underwent chymification in the stomach more rapidly and thoroughly than different kinds of meat which were passed in at the same time. Both Experiments were interesting as confirming the views of Spallanzani, and the results of the experiments made at the Hôpital La Charité of Paris, on a female with a fistulous opening in the stomach, and those obtained by Helm of Vienna in two similar cases, — as regards the effect of the juices contained in the stomach in the solution of alimentary substances.

It would have been additionally instructive to have extracted the effect of Salivia only on the same Aliments out of the body, for the purpose of deducing, whether that fluid possesses the sole agency in digestion, as supposed by Montègre, or is merely an adjuvant, as presumed by the best Physiologists, — & what are the changes effected by it on the Aliment compared with those that result from the action of the compound fluid, formed of the various secretions from the supra-diaphragmatic portion of the alimentary canal and of the stomach itself, — met with in the interior of that organ, and which was the Solvent in your Experiments.

The result of your second Experiment impressed me forcibly,

being somewhat at variance with the inferences of Sorbe, Bouchardat, Magendie and others from their experiments. — to which reference is made in the first volume, P. 455 of my Physiology. — regarding the comparative digestibility of animal and vegetable substances.

Since the period at which your first experiments were made, you have, doubtless, instituted others, which may have led you to confirm or disprove your first obtained results.

It would be signally interesting to me to learn the comparative digestibility, as tested by this individual, of the great chemical divisions of Aliments — amylaceous, mucilaginous, saccharine, acidulous, oily & fatty, caseous, gelatinous, albuminous, and fibrinous, taking as examples of each — Starch (Arrow Root, Sago, ordinary wheaten starch &c), Mucilage & Gum (Gum Arabic), Sugar, Acidulous fruits (with and without the skins), Butter & Suet, Cheese (mild and stringent), Gelatine (Isinglass), Albumen (fluid and concrete, as in the raw and boiled white of egg), and Fibrine (formed by repeatedly macerating thin slices of muscular flesh in water, under 150° of Fahrenheit); — as well as of the individual articles forming these divisions when compared with each other. These Experiments might be made either in the stomach or artificially, and it might be instructive to adopt both courses.

As regards the nature of the fluids met with in the stomach of fasting Animals, and to which, collectively, the term gastric juice has been applied, Experiments exhibit great discrepancy. It would be satisfying to me to learn the general result of your Researches. Did Litmus Paper indicate the presence of any free acid or alkali? If acid could it be discovered by burning, whether the muriatic or Acetic was the one in question, or did the fumes of Ammonia indicate the existence of either, or a solution of Nitrate of Silver that of the former? Whether or not prepared by volatile matter? Did the fluid obtained from the stomach, whilst fasting, deprive putrid substances of their septic character? Did it remove the flavor of certain aliments as of wine. Did you examine it with the microscope — at least satisfactory all methods for investigating the nature of animal fluids — and, if so, what were the appearances? Did it always coagulate milk?

It would afford me great satisfaction, also, to learn the effect of subjecting pure Fibrine, Albumen or Gelatine to the action of this fluid out of the stomach, and to see how far they experience mutations in their sensible and chemical properties. When the experiment is made on pure Fibrine, the Albumen contained in the gastric fluid, may be precipitated by a solution of the Bichloride of Mercury. The precipitate is a compound of the salt and albumen, in the proportion of about one of the former to three or four of the latter, so that, by drying the precipitate, the quantity of Albumen in the fluid can be easily determined. If the fibrinous solution be now evaporated at a moderate heat until it forms a thick mass, and concentrated acetic acid be added, with the assistance of heat a tremulous jelly is formed, which is completely dissolved by the addition of warm water, provided the mass be simply fibrine: but if the Fibrine has experienced changes during the process of artificial digestion other and different results will be obtained.

In like manner if the artificial digestion has been accomplished on Albumen, - provided the Albumen has experienced no conversion, the solution of Bichloride of Mercury will precipitate it, and the quantity of Albumen so precipitated, may be compared with that subjected to the process of digestion.

Lastly, if Gelatine has been employed, the quantity remaining after digestion may be approximated by precipitating it with Tan, prepared by infusing an ounce of Gall Nuts in a pint of water. The quantity of Gelatine in the precipitate may be roughly appreciated by considering that there are somewhat less than two parts of Tan to three of Gelatine.

In the case of the patient at La Charité, the food during its conversion into chyme, appeared to have acquired an increase of its Gelatine, and a substance in appearance fibrinous: but others have asserted that Gelatine has not been met with in the chyme, which is scarcely comprehensible where Gelatine has been the Aliment, as the Conversion must have been total.

You will pardon me for the length of the preceding detail, every topic of which has probably suggested itself to you already. It will afford me great pleasure to learn any facts which the Lake

has taught me and Dr Beaumont, of a physiological character, [illegible].
I do not abandon the hope of being in Washington in the course of
a few days. At present the roads from their engineers are almost
impassable, but if the frosty weather continues, they will be in order probably
by the commencement of next week. The whole journey has now
to be performed by land, and our Virginia Roads are proverbial
for their badness. Should I however be prevented from reaching
Washington, I may perhaps be permitted to request an account

Dr. Lovell
Surgeon General U.S.
Washington City

Dr. Remington
Lancaster Pa.
Jany 12. 1833

of your experiments and observations, in order that I may make use of
them in a second Edition of my work on Physiology, should one be
demanded, or communicate them, in your name & the American
Philosophical Society, or both, should such be your desire.

I am with great respect,
Obedient Servt,
Robley Dunglison.

Dr Lovell.